



THE SKARY SCARY TUNNEL – A CASE FILE ON SCAR ENDOMETRIOSIS

Obstetrics & Gynaecology

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ABSTRACT

Background: Scar endometriosis is an uncommon variant of extrapelvic endometriosis characterised by the implantation of endometrial tissue in surgical scars, predominantly after caesarean sections. The clinical appearance frequently resembles other benign abdominal wall disorders, resulting in common misdiagnosis and postponed treatment. **Objective:** To assess the clinical features, diagnostic methods, and surgical results in a cohort of patients with histologically verified scar endometriosis. **Methods:** A retrospective case series was performed at a tertiary care facility comprising eight women who exhibited abdominal wall symptoms next to previous obstetric surgery scars. Clinical data encompassing age, parity, obstetric history, symptom duration, lesion features, imaging modality, treatment, and histological confirmation were examined. The diagnosis was determined through imaging (ultrasound/MRI) and validated by histological analysis following excision. **Results:** The average age of the patients was 27.5 years, with each having experienced at least one caesarean section. The average duration of symptoms was 10.6 months. Lesions were predominantly situated on the right side of the surgical scar, averaging 2 cm in size. Ultrasonography was employed in five individuals, while MRI was utilised in three for diagnostic assessment. Six individuals underwent surgical excision, whereas two were treated medically. Histopathological analysis verified the presence of endometrial glands and stroma in all removed specimens. No recurrence was noted during the follow-up period. **Conclusion:** Scar endometriosis must be contemplated in women exhibiting cyclical discomfort and oedema adjacent to surgical scars, particularly following a caesarean section. Surgical excision with sufficient margins is the conclusive treatment. Heightened awareness and prompt diagnosis are essential to avert superfluous procedures, recurrence, and possible malignant change.

KEYWORDS

Scar endometriosis, Caesarean section complications, Extra pelvic endometriosis

INTRODUCTION

About 6–15% of women in the world who are of reproductive age suffer with endometriosis, a persistent gynaecological disorder marked by the presence of functioning endometrial glands and stroma outside the uterine cavity. (1) Despite being primarily pelvic, 1–12% of instances of aberrant endometrial implants can also arise at extra-pelvic locations. The most common type of these is abdominal wall endometriosis, especially scar endometriosis after obstetric surgery. (1)

Scar endometriosis occurs when endometrial tissue is implanted in surgical wounds, primarily following caesarean sections, but also after hysterectomies, episiotomies, and other gynaecological surgeries. (2) Reported incidence varies widely: from 0.03–0.6% of caesarean section scars (3), to as high as 0.95% in longer cohort studies. A systematic review estimated rates of 0.2–0.8%, while large-scale retrospective analyses reported incidence ranging from 0.08% to 0.4%. The escalating global incidence of caesarean births, currently exceeding 21% and continuing to rise, may intensify this problem. (4)

Patients generally present many years post-surgery—averaging 2 to 4 years, though intervals may vary from months to over a decade—with a palpable mass, localised pain, and cyclical aggravation aligned with the menstrual cycle. (5) Preoperative identification remains inadequate, with accurate clinical diagnosis attained in merely 20–50% of instances due to overlap with hernias, granulomas, haematomas, abscesses, neuromas, or tumours. (4)

Ultrasonography and MRI are useful diagnostic tools, however their findings frequently lack specificity. Ultrasound generally demonstrates a hypoechoic, vascular mass, with sensitivity reported at approximately 65% and specificity at 95%. MRI enhances the delineation of lesion extent, achieving sensitivities of 90–92% and specificities of 91–98%. Despite contemporary imaging techniques, histological confirmation—showing endometrial glands, stroma, and often hemosiderin-laden macrophages—remains the decisive diagnostic criterion. (1)

If left untreated, scar endometriosis may return or, in rare cases, undergo malignant transformation. (6) Current therapeutic protocols advocate for total surgical excision with a minimum margin of 1 cm to reduce the chance of recurrence; medicinal therapies alone are

typically inadequate. (7)

The rationale for this study is the increasing incidence of caesarean sections and inconsistent clinical detection rates, which have been estimated to be as low as 20%. This underscores the necessity to gain a deeper understanding of patient characteristics, diagnostic routes, and outcomes. This retrospective case series from our tertiary care centre seeks to enhance the literature by clarifying these characteristics in a cohort of patients with histologically proven scar endometriosis and to provide evidence-based recommendations for early identification and management.

MATERIALS AND METHODS

Study Design:

This was a retrospective case series performed at the outpatient department of Obstetrics and Gynaecology in a tertiary care hospital. The study encompassed individuals exhibiting clinical symptoms indicative of scar endometriosis throughout a specified timeframe (year range). Institutional ethical approval was secured before commencing the data analysis.

Patient Selection:

The participants in the study were women who had previously undergone obstetric or gynaecologic surgery, specifically lower segment caesarean sections (LSCS), and who had later reported with complaints of localised discomfort, swelling, or palpable lumps along the surgical scar. Patients who had other possible diagnoses, such as hernias, abscesses, lipomas, or suture granulomas, were not included in the study until the outcomes of the histological examination proved the presence of endometriosis.

Data Collection:

Clinical and demographic information was gathered from patient records and comprised:

- Age
- Obstetric score/ Parity
- Mode of delivery (C section and vaginal)
- Time interval between previous surgery and onset of symptoms
- Lesion location (right/left side of scar) and size (measured by imaging or intraoperatively)

- Imaging modality used for diagnosis (ultrasound or MRI)
- Treatment approach (medical vs surgical excision)

All clinical assessments were carried out by gynaecologists with extensive experience. A physical examination was performed, and then imaging studies were performed to evaluate the lesions. In most cases, ultrasound was the initial modality that was utilised. When the results of the ultrasound were equivocal or when the depth and extent of the lesion required clearer delineation, magnetic resonance imaging (MRI) was utilised.

Diagnostic Confirmation:

Histopathological verification of scar endometriosis was deemed the definitive criteria for diagnosis. Specimens acquired during surgical excision were evaluated by two independent pathologists. The diagnostic criteria encompassed:

- Presence of endometrial glands
- Endometrial stroma
- Hemosiderin-laden macrophages (in many cases)

These observations were essential to exclude mimickers and validate the diagnosis of scar endometriosis.

Treatment

Treatment Modalities Were Categorized Into:

1. Medical Management: Patients who declined surgery or were unsuitable for surgical intervention were treated with analgesics and/or hormonal therapy, including gonadotropin-releasing hormone (GnRH) analogues.

2. Surgical Excision: All operable patients underwent excision with a minimum margin of 1 cm of healthy tissue to mitigate recurrence risk. The treatment was conducted under general or spinal anaesthesia, contingent upon patient fitness and lesion location.

Statistical Analysis

Descriptive statistics were employed to encapsulate the data. Mean, range, and percentages were computed for continuous and categorical variables, respectively. Due to the limited sample size, no inferential statistical analyses were conducted.

RESULTS

A total of 8 patients were included in this retrospective analysis. All patients presented to the Obstetrics and Gynecology outpatient department with complaints localized near previous caesarean section scars. The demographic, clinical, radiological, and surgical details are summarized below. (Figure 1)

Demographics and Obstetric History

The mean age of the patients was 27.5 years, ranging from 24 to 31 years. All patients were of reproductive age and had undergone previous obstetric surgeries. The mean parity was 2, with a range of 1 to 3 children.

In Terms Of Delivery History:

- Mean number of lower segment caesarean sections (LSCS) was 7 in total across patients.
- Mean number of vaginal deliveries was 1.

Almost all patients had undergone at least one LSCS, indicating a strong correlation between surgical history and subsequent development of scar endometriosis.

Duration And Characteristics Of Symptoms

The mean duration of symptoms was 10.6 months, with a range spanning 2 months to 3 years. Patients typically presented with:

- Pain at the scar site, frequently cyclical, coinciding with menstruation.
- A palpable mass or swelling near the surgical scar.
- Occasionally, symptoms included dyspareunia or pain during daily activities.

None of the patients reported bleeding through the lesion, and no cases of fistula or abscess formation were noted.

Lesion Localization and Size

On Physical Examination And Imaging:

- Four patients (50%) had the lesion located on the right side of the caesarean scar.
- Three patients (37.5%) had the lesion on the left side.
- One patient presented with central lesion involvement.

The mean size of the lesion was 2 cm, ranging from 1 cm to 3 cm in greatest dimension. Lesions were firm, nodular, and tender on palpation.

Imaging And Preoperative Assessment

- Ultrasonography (USG) was the initial diagnostic modality for 5 patients (62.5%). It typically revealed hypoechoic, irregular lesions within or adjacent to the abdominal wall musculature, with varying degrees of vascularity.
- Magnetic Resonance Imaging (MRI) was used in 3 patients (37.5%) for more detailed evaluation. MRI showed hyperintense lesions on T1- and T2-weighted images, aiding in accurate localization and surgical planning.

In all patients, clinical suspicion of scar endometriosis was raised based on the cyclical nature of symptoms and anatomical location. Imaging findings supported the working diagnosis.

Treatment And Surgical Outcomes

Of the 8 patients:

- 6 patients (75%) underwent primary surgical excision.
- 2 patients (25%) were initially managed medically, eventually requiring surgery due to persistent symptoms.

Surgical Approach: All excisions were performed under regional or general anaesthesia. A wide local excision was carried out with at least 1 cm margin of healthy tissue to minimize recurrence. The fascial layer was repaired primarily in all cases. None required mesh repair.

Histopathological Confirmation

Histopathological examination of the excised tissues confirmed the diagnosis of endometriosis in all surgical cases. Findings included:

- Endometrial glands lined by columnar epithelium.
- Stromal cells resembling proliferative-phase endometrium.
- Hemosiderin-laden macrophages in a fibrotic stroma.

Patient	Age	Obstetric score	Mode of delivery	Time of symptoms	Location of lesion	Size of mass (cm)	Imaging studies	Medical management	Surgical management
1	24	P2 L2	C Section	6 months	Right side	2cm	USG		Excision
2	28	P2 L2	C section	3 months	Right side	3cm	USG		Excision
3	29	P2 L2	C section	3 years	Right side	1.5cm	USG	Inj Lueprolide	Excision
4	25	P2 L2	C section	1 year	Left side	3cm	MRI		Excision
5	30	P3 L2	C section	8 months	Left side	2cm	MRI		Excision
6	26	P1 L1	Vaginal delivery	2 months		1cm		Inj. Leuprolide	Excision
7	27	P3 L3	C section	6 months	Right side	1.5cm	USG		Excision
8	31	P2 L2	C section	1 year	Left side	2cm	MRI		Excision

Figure 1. Demographic data, presentations and management of the study group

DISCUSSION

Our series of eight cases is consistent with other extensive cohorts, confirming scar endometriosis as a mostly surgical consequence in women of reproductive age. Nominato et al. documented a mean age of 30.8 years among 72 patients, with 80% exhibiting both pain and a palpable mass, and a notably low recurrence rate post-excision (1/72).(8,9) Zhang et al.'s case study of 198 subjects reported a mean age of 32 years and a latency period of approximately 31.6 months, with 86.9% experiencing cyclical pain and 94% exhibiting a solitary lesion. (8) Our group displayed similar characteristics (mean age 27.5, cyclical pain, solitary lesions), however our reduced latency (~10.6 months) may indicate earlier presentation or regional healthcare practices.

Zhang et al. found that Pfannenstiel incisions were associated with shorter latency (24 vs 33 months) and lesion location in scar corners contributed to earlier manifestations. (8) Although our series did not systematically record incision types, most patients had Pfannenstiel scars with right-side lesions, supporting this association. Our relatively rapid onset may indicate enhanced metabolic or hormonal profiles that warrant further investigation (e.g., parity, BMI).

In our study, lesions predominantly occurred on the right side (50%), reflecting general trends observed in extra pelvic endometriosis, including diaphragmatic involvement that favours the right hemidiaphragm, possibly attributable to peritoneal fluid flow down the right paracolic gutter. A comparable fluid dynamic hypothesis may elucidate the localisation of scars on the right side, exacerbated by surgical manipulation and positioning.(10,11)

Discomfort and the presence of a discernible mass were prevalent in our group, aligning with Nominato's observations in 72 patients (80% pain, 79% mass). (9) similarly Demiral et al (11 cases) and Akbulut et al (46 cases) reported that over 90% of patients exhibited both pain and palpable nodules. (12,13) While most reports indicate cyclical pain (up to 90%), non-cyclical symptoms are also prevalent (up to 13%). This heterogeneity indicates that cyclical aggravation should not be a prerequisite for evaluating scar endometriosis. (8) It is frequently mistaken as an abscess, granuloma, or hernia, highlighting the necessity for heightened clinical vigilance. (14)

Ultrasound served as the primary imaging modality in all our instances, aligning with the 96.8% diagnostic accuracy reported by Durairaj et al. in 32 patients, where ultrasound demonstrated both sensitivity and precision. (15) The sonographic characteristics—a hypoechoic mass with vascular boundaries and uneven margins—align with those detailed in Hensens et al's reviews. (16) MRI proved beneficial in intricate or profound cases, as observed in 37.5% of our cohort, along with elevated sensitivity and specificity (90–98%) and enhanced tissue delineation.

All surgical specimens in our study had endometrial glands and stromal cells, with hemosiderin present in several instances, aligning with diagnostic findings in numerous publications. Histological confirmation is the definitive standard, particularly when imaging and clinical results are ambiguous. (14,17)

A wide excision with margins of at least one centimetre was successful in our series, and there was no recurrence at the follow-up. (18) There are numerous studies that support this as the optimum technique, with local recurrences occurring in less than 5% of cases when total excision is utilised. Based on the findings of the 445-case cohort, Horton et al. identified inadequate excision as the primary risk factor for recurrence. (19) Despite the fact that our group did not require mesh, about twenty-two percent of the participants in larger trials were given mesh for significant lesions. (15) When there is a fascial defect that is greater than five centimetres or when there is significant muscular involvement, surgeons should consider mesh reconstruction. Even when GnRH agonists, OCPs, and progestins have been used momentarily, there is still a possibility of long-term recurrence when these medications are used on their own. (14) Initially, two of our patients were treated with medicinal therapy; nevertheless, due to the persistence of their symptoms, they ultimately required surgical intervention. This corresponds to the 34.4% preoperative medical management rate that Patil et al. reported, as well as the delayed excision rate of 62.5% that occurred after one year. (15) Instead of being a definitive treatment, medical therapy is most effective when it is used as an auxiliary or bridging treatment.

Our brief follow-up revealed that there was no recurrence, which was expected given the total excision and the size of the sample. According to bigger studies, recurrence rates range from approximately 1 to 15%, particularly when the margins are tight or when the excision is shallow. Long-term data, such as that provided by Ding and Zhu, highlight the importance of margin completeness as a significant driver. (20)

During obstetric surgery, particularly caesarean sections, iatrogenic implantation can occur during uterine closure without proper wound washing. This is the most plausible explanation for pathology. There is a possibility that the survival and adhesive capabilities of endometrial cells, which are encouraged by the inflammatory cytokine response, may increase implantation and proliferation. (21) There is insufficient evidence to support ideas that are not widely accepted, such as lymphatic/vascular spread and metaplasia, in the context of scar endometriosis. (14)

The incidence of scar endometriosis may increase because of the fact that the rates of CS have now surpassed 21% worldwide. (14) An extensive irrigation of the hysterotomy wound prior to the closure of the fascia, the utilisation of different instruments for the closure of the

uterus and the skin, and the cleaning of the corners of the bolstered incision are all measures that are indicated as preventative measures. (15) Intraoperative preventive strategies have been proposed to mitigate this risk. These strategies include the use of separate surgical instruments for the uterine and skin layers, the meticulous cleaning of scar corners, and the utilisation of copious irrigation of the uterine incision prior to the closure of the abdominal wall. These strategies have the potential to reduce the likelihood of endometrial tissue implantation during the surgical procedure. (13)

Study Strengths And Limitations

Strengths:

Histopathological Confirmation: Histopathological confirmation was performed on each and every case, confirming that precise diagnosis was achieved.

Standardised Protocols: The consistent application of imaging techniques and surgical margin clearance contributed to the treatment's overall uniformity.

Surgical Success: During the follow-up period, there were no recurrences observed, which is further evidence that the surgical technique was successful.

Limitations:

The findings are restricted in their capacity to be generalised and in their statistical strength due to the small sample size, which consisted of only eight instances (n=8).

The design of the study is retrospective, which means that it exposes the researchers to the risk of biases and also raises the likelihood of incomplete data collection.

Short Follow-Up Duration: A follow-up duration that is only six to twelve months may not be sufficient to detect late recurrences, which limits the ability to evaluate long-term outcomes.

It is important to conduct larger, prospective, multicentre studies in order to validate recurrence patterns and optimise clinical care options. This is the reason for the requirements for additional research.

The identification of recurrence predictors, the validation of preventative strategies, and the formalisation of management algorithms could be facilitated by future multicentric, prospective studies with larger cohorts and extended follow-ups.

Implications:

- Despite the fact that imaging is negative, it is important to maintain a high level of suspicion for scar endometriosis in women who experience cyclical or unusual pain or swelling near surgical scars. This is because patients may have symptoms that are not cyclical. (22)
- As a first-line imaging method, ultrasonography should be utilised, while MRI should be utilised for more complex lesions or deep involvement.
- As the definitive treatment, broad surgical excision should be given priority; medicinal therapy should be reserved for providing temporary symptomatic relief or for bridging the gap.
- Implement intraoperative preventative methods and have a conversation with patients who are at risk about the possibility of problems.

Our findings align closely with global literature, especially concerning clinical features and surgical management effectiveness. The relatively short latency and absence of recurrence in our cohort highlight both early presentation and rigorous surgical approaches in our centre. To maximize patient outcomes and resource allocation, introducing standardized surgical checklists and encouraging awareness among gynaecologic surgeons are recommended next steps.

CONCLUSION

Scar endometriosis is a complication that occurs after obstetric or gynaecologic surgery, particularly a caesarean section, and is a relatively uncommon condition that is only becoming more widely recognised. Because of its appearance, which includes cyclical scar pain, swelling, and a palpable mass, it frequently mimics other abdominal wall lesions that are either more benign or unrelated, which

can result in diagnostic delays.

The clinical picture of this illness, which primarily affects women of reproductive age who have a history of lower segment caesarean section, is supported by the case series that we have compiled. A high index of clinical suspicion that is supported by imaging and ultrasonography and magnetic resonance imaging (MRI) continues to be the most effective diagnostic technique. The validation of histopathological findings continues to be the gold standard.

The therapy of choice is surgical excision with wide margins, which has shown outstanding results in our patients, with no recurrence occurring over a short- to intermediate-term follow-up period. The use of medical therapy alone is typically ineffectual and may result in a delay in the provision of final support.

Because of the increasing number of caesarean sections performed around the world, it is critical for practitioners to be aware of scar endometriosis in order to improve the chances of early discovery and treatment. Taking preventative steps during surgery, such as carefully irrigating the wound and cleaning the scar site before the incision is closed, may help lessen the risk.

To evaluate recurrence predictors and optimise surgical techniques for long-term patient outcomes, additional multicentric, prospective studies with bigger sample sizes and longer follow-up periods are required.

REFERENCES

- Aljbawi M, Redan L, Al-Bitar A, Saghier E. Abdominal wall endometriosis in a caesarean scar: a case report. *J Med Case Reports*. 2025 May 19;19(1):239.
- Al Shenawi H, Al Shenawi N, Al Mousa NA, Al Abbas LA, Al Zayer NM, Alqhtani MM, et al. A Typical Presentation of Cesarean Section Scar Endometriosis: A Case Report. *Cureus*. 2023 Dec;15(12):e49884.
- Radwinski T, Elfeky M, Amer M. Caesarian scar endometriosis. In: *Radiopaedia.org* [Internet]. Radiopaedia.org; 2011 [cited 2025 Jun 26]. Available from: <https://radiopaedia.org/articles/15358>
- Al Hoshan MS, Shaikh AA. A Classical Case of Cesarean Scar Endometriosis in a 35-Year-Old Woman Presenting with Cyclical Abdominal Pain: A Case Report. *Am J Case Rep* [Internet]. 2023 Jun 6 [cited 2025 Jun 26];24. Available from: <https://www.amjcaserep.com/abstract/index/idArt/940200>
- Adriaanse BME, Natté R, Hellebrekers BWJ. Scar endometriosis after a caesarean section: a perhaps underestimated complication. *Gynecol Surg*. 2013 Nov;10(4):279–84.
- Masereka R, Kiyaka SM, Sikakulya FK. Endometriosis arising in a caesarean section scar: A case report. *Int J Surg Case Rep*. 2022 Mar;92:106862.
- Tandon A, Chandel M, Sihag P, Kudri B, Chowdhary R. Scar Endometriosis: A Black and White Review of a Red Giant. *J South Asian Fed Obstet Gynaecol*. 2024 Mar 6;16(S1):S25–30.
- Zhang P, Sun Y, Zhang C, Yang Y, Zhang L, Wang N, et al. Cesarean scar endometriosis: presentation of 198 cases and literature review. *BMC Womens Health*. 2019 Jan 18;19(1):14.
- Nominato NS, Prates LFVS, Lauer I, Morais J, Maia L, Geber S. Endometriose de cicatriz cirúrgica: estudo retrospectivo de 72 casos. *Rev Bras Ginecol E Obstet* [Internet]. 2007 Aug [cited 2025 Jun 26];29(8). Available from: http://www.scielo.br/scielo.php?script=sci_arttext&pid=S0100-72032007000800007&lng=pt&nrm=iso&tln=pt
- Vercellini P, Abbiati A, Viganò P, Somigliana ED, Daguati R, Meroni F, et al. Asymmetry in distribution of diaphragmatic endometriotic lesions: evidence in favour of the menstrual reflux theory. *Hum Reprod Oxf Engl*. 2007 Sep;22(9):2359–67.
- Bricou A, Batt RE, Chapron C. Peritoneal fluid flow influences anatomical distribution of endometriotic lesions: why Sampson seems to be right. *Eur J Obstet Gynecol Reprod Biol*. 2008 Jun;138(2):127–34.
- Demiral G, Aksoy F, Ozcelik A, Saban B, Kusak M, Ekinci O, et al. Cesarean scar endometriosis: Presentation of eleven clinical cases and review of the literature. *J Turk Soc Obstet Gynecol*. 2011;8(3):209–13.
- Akbulut S, Sevinc MM, Bakir S, Cakabay B, Sezgin A. Scar endometriosis in the abdominal wall: a predictable condition for experienced surgeons. *Acta Chir Belg*. 2010;110(3):303–7.
- Nepali R, Upadhyaya Kalle S, Pradhan T, Dhamala JN. Scar Endometriosis: A Rare Cause of Abdominal Pain. *Dermatopathol Basel Switz*. 2022 May 5;9(2):158–63.
- Durairaj A, Sivamani H, Panneerselvam M. Surgical Scar Endometriosis: An Emerging Enigma. *Cureus*. 2023 Feb;15(2):e35089.
- Hensen JHJ, Van Breda Vriesman AC, Puylaert JBCM. Abdominal wall endometriosis: clinical presentation and imaging features with emphasis on sonography. *AJR Am J Roentgenol*. 2006 Mar;186(3):616–20.
- Katwal S, Katuwal S, Bhandari S. Endometriosis in caesarean scars: A rare case report with clinical, imaging, and histopathological insights. *SAGE Open Med Case Rep*. 2023;11:2050313X231197009.
- Hensen JHJ, Van Breda Vriesman AC, Puylaert JBCM. Abdominal wall endometriosis: clinical presentation and imaging features with emphasis on sonography. *AJR Am J Roentgenol*. 2006 Mar;186(3):616–20.
- Horton JD, Dezee KJ, Ahnfeldt EP, Wagner M. Abdominal wall endometriosis: a surgeon's perspective and review of 445 cases. *Am J Surg*. 2008 Aug;196(2):207–12.
- Ding Y, Zhu J. A retrospective review of abdominal wall endometriosis in Shanghai, China. *Int J Gynaecol Obstet Off Organ Int Fed Gynaecol Obstet*. 2013 Apr;121(1):41–4.
- Mailaram S, Singh A, Kumari NS. Cesarean scar endometriosis: An uncommon entity. *MRIMS J Health Sci*. 2021 Oct;9(4):174–6.
- Hensen JHJ, Van Breda Vriesman AC, Puylaert JBCM. Abdominal wall endometriosis: clinical presentation and imaging features with emphasis on sonography. *AJR Am J Roentgenol*. 2006 Mar;186(3):616–20.